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## (54) Miniature printer.

(57) In order to print characters with a greater number of designs than the designs of types actually provided, a miniature printing apparatus has a type drum or a type belt carrying type rows containing types of the same characters of different designs, and a mechanism for shifting the type drum or the type belt to bring a desired character of a desired design to a printing position, and a mechanism for impacting this type against a recording paper. Consequently, characters can be emphasized without requiring use of inks of different colors. Each character of a first design (I) has a size smaller than that of the same character of a second design (II) the latter including a white blank portion of a configuration corresponding to the character of the first design, so that a character of a third design (III) can be printed in addition to the characters of the first and second designs, by combining the prints of character of the first and second designs.

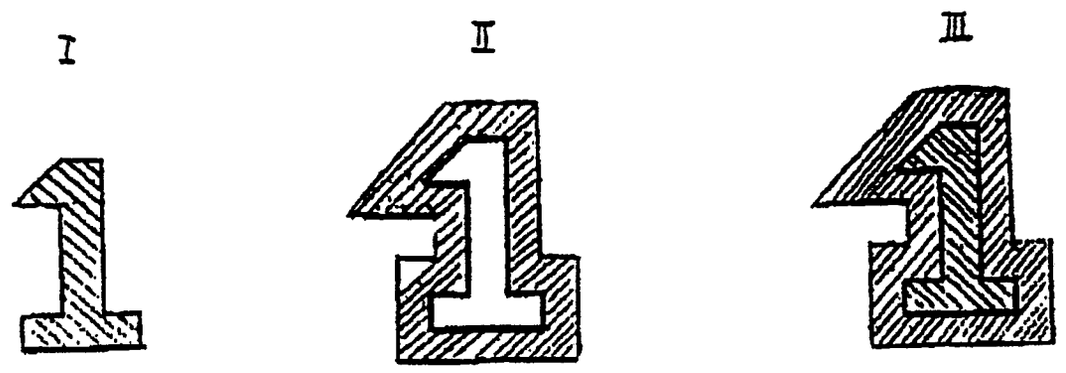


FIG. 5

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The present invention relates to an improvement in the construction of a type wheel of a type printer mounted on a miniature electronic device.

A type-wheel type printer used in miniature electronic devices is required to be small in size. As a consequence, the kinds of types which can be carried by the type wheel, which forms a group of fonts, are undesirably limited. To cope with this problem, when it is desired to, for example, emphasize characters, it has been attempted to prepare a plurality of type wheels having the same types and to ink pads for applying inks of different colors to these type wheels so that characters are printed in different colors as required, thus increasing the number of printable characters. Such an attempt is proposed, for example, in JP-A- 56-137984 and JP-A-57-100089.

These proposals are effective in emphasizing desired portions of a document by enabling the same characters to be printed in different colors, but suffer from the following disadvantages. Firstly, it is to be pointed out that the quality of the print tends to be degraded due to mixing of inks of different colors. In addition, a complicated mechanism is required to set a selected one of ink rollers of different colors at a position where it cooperates with the type of the character to be printed. In addition, the cost of the ink rollers is raised due to the necessity for special ink rollers which are improved to avoid mixing of inks of different colors. Furthermore, the kinds of the fonts are impractically limited by the number of colors of the inks.

Accordingly, an object of the present invention is to provide a novel type printing apparatus which can print, with an ink of one color, characters in a greater number of character designs than the character designs which are actually provided, thereby overcoming the above-described problems of the prior art.

This object is achieved with a miniature printing apparatus as claimed in claim 1.

Specific embodiments of the invention are subject matter of the dependent claims.

According to the invention, different sets of types having different designs are arranged in the type rows and any one of these different designs can be used selectively so that characters can be emphasized as desired without necessitating the use of different colors. Furthermore, degradation of the print due to, for example, mixing of inks of different colors is avoided because the printing apparatus of the invention does not necessitate the use of inks of different colors.

The above and other objects, features and advantages of the present invention will become clear from the following description of the preferred embodiment when the same is read in conjunction with the accompanying drawings, in which:

Fig. 1
is a longitudinal sectional view of a printing apparatus embodying the present invention;
Fig. 2
is a cross-sectional view of the printing apparatus of Fig. 1;
Fig. 3
is an exploded perspective view of the printing apparatus;
Fig. 4
is a developed view of a type sheet incorporated in the printing apparatus of the present invention;
Fig. 5(I)
is an illustration of types of characters of a first design formed on the type sheet;
Fig. 5(II)
is an illustration of types of characters of a second design formed on the type sheet;
Fig. 5(III)
is an illustration of characters formed by printing with types of the first and second designs in a superposed manner;
Fig. 6
is a block diagram of an example of a controller for controlling and driving a pulse motor and solenoids which form a printing mechanism;
Fig. 7
is a timing chart illustrative of the operation of the controller;
Fig. 8
is an illustration of the positional relationship obtained between the type sheet and hammers when the types of the first design are selected;
Fig. 9
is an illustration of the positional relationship obtained between the type sheet and hammers when the types of the second design are selected;
Fig. 10(I) and 10(II)
are illustrations of the positional relationship between a paper feed drive gear formed on a type drum and a paper feed gear;
Fig. 11(I)
is an illustration of types of characters of a first design formed on another example of the type sheet;
Fig. 11(II)
is an illustration of types of characters of a second design formed on the type sheet of Fig. 11(I);
Fig. 11(III)
is an illustration of characters formed by printing with types of the first and second designs of Figs. 11(I) and 11(II) in a superposed manner;
Figs. 12(I) to 12 (IV)
are illustrations of examples of types;
Figs. 13(a) and 13(b)

are illustrations of type rows of first and second designs which are selectively used in combination;

Fig. 14

is an illustration of another embodiment of the printing apparatus in accordance with the present invention;

Fig. 15

is a perspective view of type belts used in the embodiment shown in Fig. 14;

Fig. 16(I)

is a schematic illustration of a type belt shift mechanism in a state selecting a first type belt;

Fig. 16(II)

is a schematic illustration of a type belt shift mechanism in a state selecting a second type belt;

Figs. 17(a) and 17(b)

are illustrations of designs of types used in the printing apparatus shown in Fig. 14;

Fig. 18(I)

is an illustration of types of characters of a first design formed on still another example of the type sheet;

Fig. 18(II)

is an illustration of types of characters of a second design formed on the type sheet of Fig. 18(I); and

Fig. 18(III)

is an illustration of characters formed by printing with types of the first and second designs of Figs. 18(I) and 18(II) in a superposed manner.

Referring to Figs. 1, 2 and 3 shcwing a first embodiment of the present invention, a type drum 1 is composed of a cylinder 2 as a carrier member and a type sheet 3 provided on the surface of the cylinder 2. Guide grooves 4 and 5, which are provided on one end of the cylinder 2 in such a manner as to partially cross each other as at 5a, are adapted to effect an axial shift by an amount corresponding to one row of type rows or rings when the cylinder 2 makes one full rotation. Projections 8 are provided on one end of the cylinder 2 so as to be received in grooves 6b formed in the rotor 6a of a pulse motor 6 which is fixed to a base 7. A paper feed drive gear 9 which is fixed to the other end of the cylinder 2 engages with a paper feed gear 45 which will be mentioned later. A rotation detector 10 is associated with this end of the cylinder 2 so as to detect rotation of the cylinder 2. The rotation detector is composed of a first detection spring 11 and a second detection spring 12. The arrangement is such that, when the type drum 1 rotates at an axial position corresponding to the "lower place" (shifted to the left as seen in Fig. 3), a bent portion 11a of the first detection spring rides on a reset signal cam 14 of the type drum 1 so as to be urged into contact with the second detection spring 12, thereby generating a reset signal.

The cylinder 2 also is provided with through-holes 15 which are formed in a portion of the cylinder 2 where the type sheet 3 is to be attached and which are adapted to receive projections formed on the type sheet 3. A hammer unit 16 is provided inside the cylinder 2.

The hammer unit 16 includes a plurality of solenoid actuator units 20 which are arranged in the axial direction such as to correspond in number at least to the number of places or digits to be printed. Each solenoid actuator unit 20 includes a solenoid 17, a movable iron core or plunger 18 actuated by the solenoid and a hammer 19 connected to the end of the plunger so as to be able to engage with the projections of two rows of types.

The hammer unit 16 is provided on both ends thereof with mounting tabs 22 and 23 one (22) of which extends through the pulse motor 6 while the other 23 is fixed to the base 7 while being rotatably supported by the type drum through a bearing 24.

In this arrangement, when a driving current is supplied to one of the solenoids 17, so that the plunger 18 is attracted by the solenoid 17 with the result that the hammer 19 strokes the projection 32a on the type sheet 3, whereby the type corresponding to the projection 32a impacts a sheet of recording paper.

Fig. 4 is a developed view of the type sheet 3. The type sheet 3 is made of an elastic material such as a rubber. It will be seen that each of the different hammers has its own coverage (1), (2), (3) ... and each coverage includes to rows I and II of types. Thus, the rows I and II of types are arranged alternatingly as represented by I, II, I, II, I, II and so on. In each coverage, two rows of types include types 30 and types 31, respectively. In each row, the types 30 or 31 are arranged at a constant pitch in the circumferential direction (vertical direction as viewed in Fig. 4) with a spacer 32 or 33 placed between adjacent types. Thus, in the first row I of the coverage (1), the types 30 and the spacers 32 are arranged alternatingly in the circumferential direction. Similarly, in the second row II of the coverage (1), the types 31 and the spacers 33 are arranged such that they appear alternatingly in the circumferential direction. Furthermore, in each of the coverages, the types of the first and second rows I and II are arranged in a staggered manner such that each type contacts with a spacer in the other row.

For the purpose of clarification of the description, each hammer will be identified in terms of the number of its coverage. Thus, the hammer which covers the coverage (2) will be expressed as the hammer [2]. The designs of the types are as follows. In case of the coverage (2) covered by the

hammer [2], the row corresponding to the lower place (right side as viewed in the figure) of printing, i.e., the row I, contains types of comparatively thin lines as shown in Fig. 5(I), whereas the row corresponding to the higher place (left side as viewed in the figure). i.e., the row II, contains types having white blanks of profiles corresponding to the profiles of the types on the lower place of order (the row (I)). A nonprint region 49 where is no type is provided in the region opposing the groove crossing portion 5a for axially shifting the type drum 1 between the upper place position and the lower place position.

The pulse motor 6 is of an outer-rotor type with an exposed rotor. Ratchet teeth 34 are formed on the surface of the rotor 6a at positions corresponding to the positions of the types on the type wheel. The ratchet teeth 34 are adapted to engage with a ratchet pawl 35 provided on the base 7 so as to stop the types 30 and 31at printing positions 28 (Fig. 2) in a clicking manner.

A numeral 36 denotes an ink roller which is covered by a frame except a portion thereof facing the types. The ink roller 36 is carried by a shaft 38 which is rotatable on an ink roller frame 40. The ink roller frame 40 is mounted on the base 7 so as to be rockable in the axial direction. The ink roller frame 40 has a projection 40a engaging with a groove 39 formed in the type drum 1, so that the ink roller frame is axially shiftable accompanying the axial movement of the type drum 1.

Numeral 42 denotes a platen which is provided at its center with a paper feed roller 43 and which is carried by the base 7. A paper feed shaft 44 which is journaled at its front end by the platen 42 engages with the paper feed roller 43. The aforementioned paper feed gear 45 is urged by a spring 46 provided on the base 7 such that its front end makes a pressure contact with the rear end of the paper feed shaft 44. The arrangement is such that the paper feed shaft 44 and the paper feed gear 45 in cooperation form a one-way clutch. A paper pressing roller 47, which is rotatably carried by the base 7, is urged into pressure contact with the paper feed roller 43 so that the paper feed roller 43 and the paper pressing roller 47 cooperate with each other in feeding the recording paper without fail.

A type drum rocker member 50 is rotatably secured at its lower end to the base 7 and has an upper portion of a ship-like stream-lined cross-section. This upper portion makes a sliding engagement with at least one of the grooves 4 and 5 to slide along the groove in accordance with the rotation of the type drum 1 and moves from one to the other of the grooves 4, 5 at the crossing portion 5a of these grooves.

Fig. 6 shows an example of a controller for controlling the operation of the printing apparatus described hereinbefore. Numeral 60 designates a microcomputer which receives a reset signal from a reset signal generator 10 and is capable of receiving also printing data from, for example, a host device such as a measuring instrument or desk-top calculator through an interface. The microcomputer also delivers, through an interface, signals to a pulse motor drive circuit 61 and a solenoid drive circuit 62 to enable selection of the types corresponding to the printing data and printing with the selected types.

The operation of the described printing apparatus will be explained with specific reference to a timing chart shown in Fig. 7.

In the initial period of the printing, the type drum rocker member 50 engages with the groove 4 in the type drum 1 so that the type drum is located at the position corresponding to the lower place of printing, i.e., the position closer to the pulse motor 6.

Therefore, the types of the rows I of the rows I and II, denoted by the line numbers 1, 3, 5, ..., 17 (Figs. 8, 9) are located in the printing positions of the coverages (1), (2), (3), ..., (9) of the respective hammers 19. When the pulse motor 6 operates in the direction of an arrow A (Fig. 2) in accordance with an instruction from the microcomputer 60, types on the type rows I are successively brought to the printing position in each of the hammer coverages, as a result of the rotation of the type drum. When the type of the character to be printed is brought to the position where it faces the printing position 28, the operation of the pulse motor 6 is stopped and then reversed so as to operate in the direction of the arrow B. As a result, a ratchet tooth 34 is stopped by the pawl 35 so as to stop the reversing, whereby the type of the character to be printed is exactly and promptly located at the printing position.

In this stage, the microcomputer 60 operates to energize the solenoid 17 corresponding to the hammer coverage in which the type to be printed opposes the printing surface, so that the hammer 19 of this coverage strikes the type thereby printing the character of this type on the recording paper. Although the hammer 19 impacts two character rows, only the character of the type row I is printed because no type but a spacer faces the printing surface in the type row II.

The microcomputer 60 operates to cause the pulse motor 2 to rotate forward, i.e., in the direction of the arrow A, when the solenoid 17 is de-energized to finish the printing. This operation is repeated each time the desired type is brought to the position facing the recording paper. When the type drum has made almost one full rotation, all the types on the type row I have passed the position

facing the recording paper. It is therefore possible to print any desired character of the first design of the types shown in Fig. 5(I).

When the type drum has made almost one full rotation, the type drum rocker member 50 slides into the other groove 5 through the crossing portion 5a of both grooves 4 and 5. As a consequence, the type drum 1 is urged by the type drum rocker member 50 toward the position for printing the upper place data to move to this position from the position for printing data of the lower place data. This operation is conducted in a period II of the time chart shown in Fig. 7.

As a consequence, in respective hammer coverages, the types of the row II, i.e., the types of the second design having white blanks as shown in Fig. 5(II), are positioned in the printing positions.

When the type of the desired character is positioned to face the printing paper, the microcomputer 60 operates to stop the pulse motor 6 as in the previous step and then reverses the same to exactly locate this type at the printing position, followed by energization of the solenoid 17. As a result, the hammer 19 strikes the projection on the type, so that printing is made with the type on the type row corresponding to the upper place of printing, i.e., the characters of the second design shown in Fig. 5(II), is printed. This operation is executed in a period III in Fig. 7.

The character of the second design is printed as shown in Fig. 5(II) when the printing is done on an area where the printing of the same character with the type of the first design of Fig. 5(I) has not been done. However, if a character of a design, e.g. the second design (II), is printed on the same position as the position where the printing of the same character of the other design, i.e. the first design, had been printed before the prints of the characters of both designs are superposed on each other so that the character of a third design, which is a combination of the first and second designs, is printed as shown in Fig. 5(III).

It is thus possible to obtain prints of characters in a third design, although types of such third design are not actually provided on the type drum.

In the printing operation described above, the type drum 1 rotates to a position where the paper feed drive gear on the type drum 1 would engage with the paper feed gear 45. In this case, however, since the type drum 1 has been shifted axially to the position for the printing in the upper printing place, i.e. the left position as viewed in Fig. 1, the paper feed gear 45 cannot engage with the paper feed drive gear 9, so that the paper feed gear 45 is kept stationary regardless of the rotation of the type drum 1. Thus, the feed of the paper is not conducted.

In this state, the reset signal cam 14 of the type drum 1 has been rotated to an angular position where it would contact the bent portion 11a of the first detection spring 11. In this case, however, the reset signal cam 14 does not contact the first detection spring 11 because the type drum 1 has been axially shifted to the position for printing characters in the place of the higher order, so that no reset signal is generated.

When the type drum 1 has made almost one full rotation after its axial shift to the position for printing in the place of higher order, the drum rocker member 50 moves back into the other groove 4 through the crossing portion 5a between the grooves 4 and 5. As a result, the type drum 1 is urged towards the position for printing in the place of lower order so as to be moved to this position from the instant position for printing characters in the place of the higher order. This operation is done in a period IV shown in Fig. 7.

As a result of the axial shift of the type drum to the position for printing in the place of lower order, the paper feed drive gear 9 is brought to the position where it can engage with the paper feed gear 45. Likewise, the reset signal cam 14 is moved to the position where it can engage with the first detection spring 11.

A further rotation of the type drum 1 causes the paper feed drive gear 9 to engage with the paper feed gear 45 to enable the latter to feed the paper by an amount corresponding to one printing line. During this paper feeding operation, the reset signal cam 14 engages with the bent portion 11a of the first detection spring 11 so as to lift it into contact with the second detection spring 12, thereby generating a reset signal. This is done in a period V of Fig. 7.

Upon receipt of the reset signal, the microcomputer 60 operates to stop the operation of the pulse motor 6 when the type drum 1 has been rotated to a predetermined position of rotation, whereby a printing cycle for printing one line of data is completed. The described operation is repeated so that data is printed in a plurality of lines.

In the described embodiment, two grooves are formed in the type drum so as to be traced by the rocker member provided on the frame thereby to cause rocking of the type drum between two axial positions. This, however, is not exclusive and it will be clear to those skilled in the art that a similar effect is obtainable when the described rocking mechanism is replaced with a suitable mechanism such as a cam mechanism or a solenoid capable of effecting the rocking or reciprocatory motion of the type drum between two axial positions.

Figs. 11(I) to 11(III) show another embodiment of the present invention in which the types of the first design are formed by comparatively thin lines as shown in Fig. 11(I), while the second design has

an internal blank of the same configuration as the first design but greater than the first design, as shown in Fig. 11(II). Thus, a character of a third design, having an internal blank 65 as shown in Fig. 11(II) is obtained as the prints of the character formed by the types of the first and the second design are superposed.

Figs. 18(I) to 18(III) show still another embodiment in which the first design of type is composed of comparatively thin lines as shown in Fig. 11(I), while the second design of the type has an internal white blank of the same configuration as the first design but slightly smaller than the same. For instance, referring to Figs. 18(I) and 18(II), the dimensions L1, L2 and L3 at the cross-sections taken along the chain lines are determined to meet the condition of $L2 < L1 < L3$. When the prints of the character of both designs are superposed, the images of the printed character of both designs partially overlap each other, as shown in Fig. 18-(III). This overlap allows any misregistration of the printing so as to ensure that the printed character has a completely painted portion. More specifically, this embodiment provides a tolerance of error in the printing position up to $(L1 - L2)/2$. Figs. 12(I) to 12 (IV) show different examples of type design which are different in inclination angle or size.

In the embodiments described hereinbefore, the types are arranged in rows such that the row of the types of the first design and the row of the types of the same characters of the second design are offset from each other in the direction of the order of the printing place, i.e., in the axial direction of the type drum. This, however, is only illustrative and the arrangement may be such that, as shown in Fig. 13(a), each row is divided into two regions 66 and 67 in the circumferential direction of the type drum and the types of the first design and the types of the second design are respectively provided in the first and second circumferential regions. It is also possible to arrange such that the types of the first and second designs appear alternatingly in the circumferential direction as shown in Fig. 13(b). It will be seen that the same advantages are brought about by the arrangements of Figs. 13-(a) and 13(b) as those offered by the embodiments described before. Furthermore, the latter embodiments can simplify the construction of the printing apparatus because the printing apparatus is not required to have any mechanism for effecting an axial shift of the type drum.

It will also be clear that the same advantages are obtained in a printer of the type in which a type impacts a recording paper through the intermediary of an ink ribbon, although in the described embodiment the printing is made by transferring an ink from the type which has been wetted through a contact with an ink-impregnated ink roller.

Referring now to Fig. 14 showing a different embodiment, numerals 70 and 71 denote type belts which are stretched between a drive pulley 73 driven by a pulse motor 72 and an idle pulley 74 so as to form upper and lower stages as shown in Fig. 15 and so as to extend substantially in parallel with the breadth of a recording paper 75. As the pulse motor 72 operates, the type belts 70 and 71 run in the direction of an arrow A in Fig. 14. As will be seen from Figs. 16(I) and 16(II), these type belts 70 and 71 are set on a type belt sliding mechanism which is generally denoted by 77 and which includes a link mechanism adapted to be actuated by a solenoid 76. Numeral 78 denotes a hammer for pressing a type on one of the type belts onto the recording paper. The hammer is arranged substantially in parallel with the printing line so as to be moved in the direction of the breadth of the recording paper as denoted by an arrow B in Fig. 14, by the operation of a guide member 79 which is rotatingly driven by the drive pulley 73 through meshing gears.

One (70) of the type belts carries a types of a first design shown in Fig. 17(a) while the other belt 71 carries types of a second design shown in Fig. 17(b).

In operation of this embodiment, the type belts 70, 71 are driven to rotate in the direction of breadth of the recording paper 75 so that the types on the type belts 70, 71 scan the recording paper in the direction of place of order. In this state, since the solenoid 76 is not energized, the type belts 70, 71 run such that the types on the first belt 70 in Fig. 17(a) face the recording paper.

As the hammer 78 is activated in this state, the hammer strikes the type against the recording paper 75, whereby the character of the first design is printed.

On the other hand, energization of the solenoid 76 causes the link mechanism 77 to lift the type belts 70 and 71 as shown in Fig. 16(II), so that the second type belt 71 is brought to the position where it faces the printing line. Activation of the hammer 78 in this state causes the character of Fig. 17(b) of the second design on the type belt 71 to impact the recording paper, thereby printing the character of the second design.

In the embodiments described in Figs. 14, 15 and 16(I), 16(II), the types of the first design and the second design are provided on different type belts. This, however, is not essential and the arrangement may be such that types of a plurality of different designs are formed in different regions of a single belt as in the case of the modifications to the preceding embodiments. In such a case, the necessity for the mechanism for effecting vertical shift of the type belts is eliminated to enable printing of different designs with a simplified construc-

tion of the printing apparatus.

As will be fully understood from the foregoing description, the present invention provides a printing apparatus comprising a plurality of type rows having types of the same characters of different designs, means for selecting a type of a desired design and bringing the selected type to a position where it faces a printing region, and means for impacting the selected type against a recording paper. It is therefore possible to obtain a plurality of print designs greater in number than the number of the designs of types actually prepared. Furthermore, since the necessity for the use of inks of different colors is eliminated, it is possible to simplify the construction of the apparatus through simplification of the ink supplying mechanism, while avoiding degradation of the printing quality caused by, for example, of mixing of the inks.

## Claims

1. A miniature printing apparatus comprising: a plurality of type rows (I, II) having types (30, 31) of the same characters of different designs; means (4, 5, 6, 50) for selecting a type of a desired design and bringing the selected type to a position where it faces a printing region (28); and means (16) for impacting the selected type against a recording paper.

2. A miniature printing apparatus according to claim 1, wherein said type rows (I, II) are arranged on the outer periphery of a cylindrical drum (1).

3. A miniature printing apparatus according to claim 1, wherein said type rows is formed on a belt (70, 71).

4. A miniature printing apparatus according to any one of claims 1 to 3, wherein each character of a first design has a size smaller than that of the same character of a second design the latter including a white blank portion of a configuration corresponding to that of said character of said first design.

5. A miniature printing apparatus according to claim 4, wherein the white blank portion of said character of said second design has the same configuration as said character of said first design.

6. A miniature printing apparatus according to claim 4, wherein the white blank portion of said character of said second design has a size greater than that of said character of said first design.

7. A miniature printing apparatus according to claim 4, wherein the white blank portion of said character of said second design has a size smaller than that of said character of said first design.

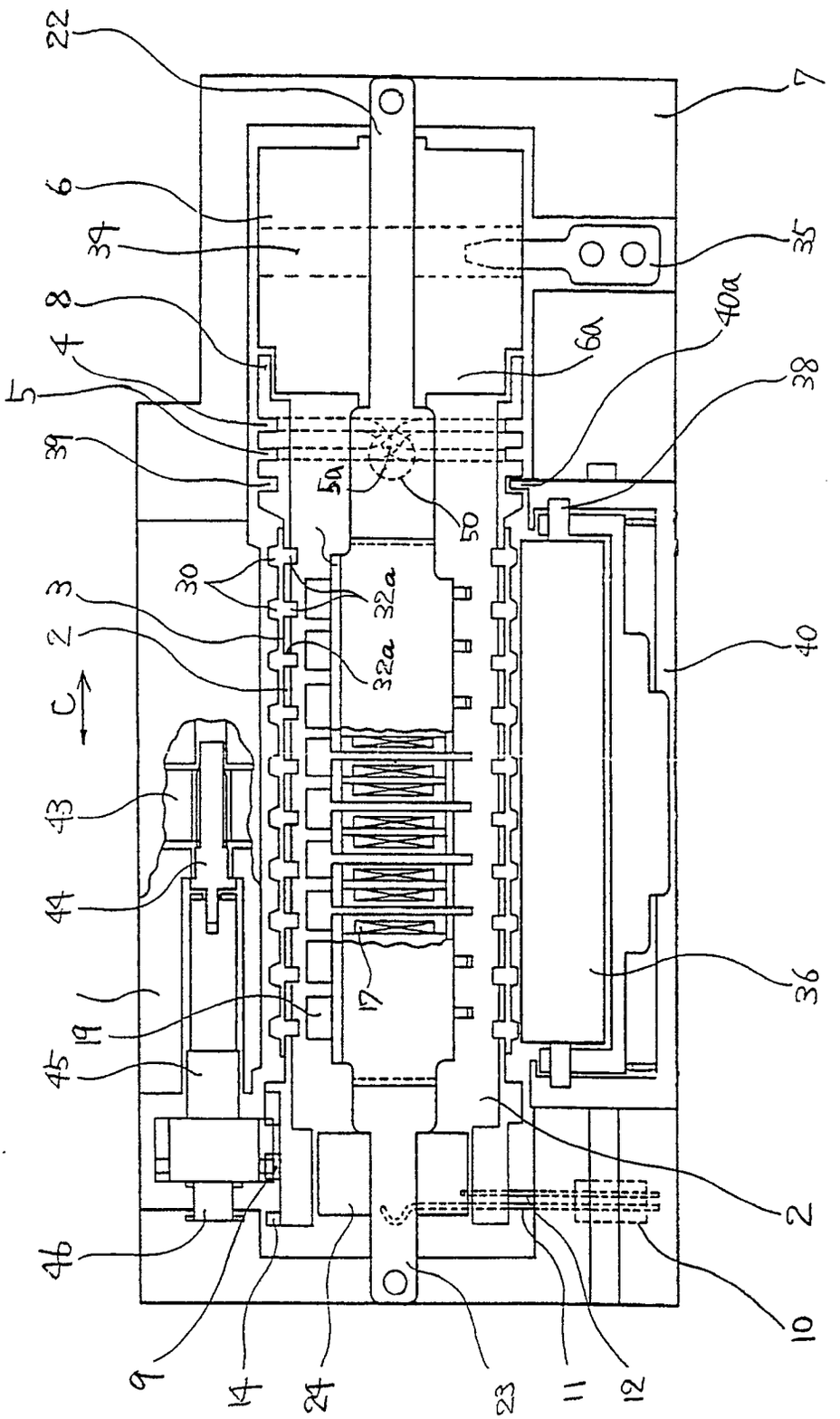
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FIG. 1

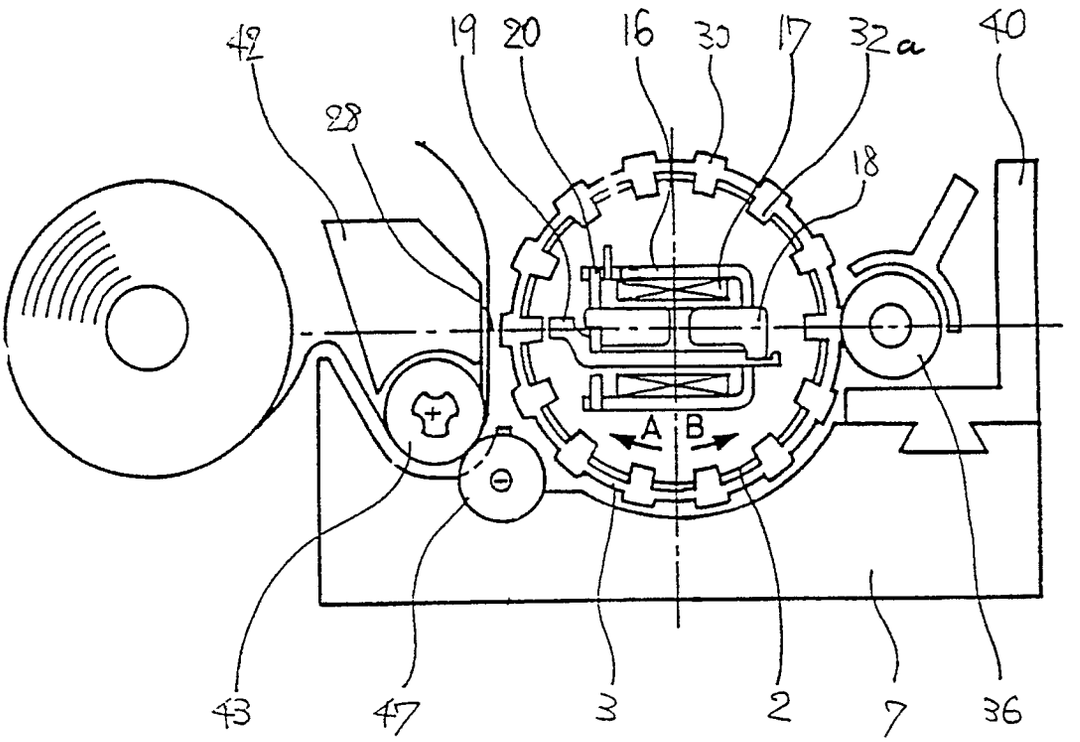


FIG. 2

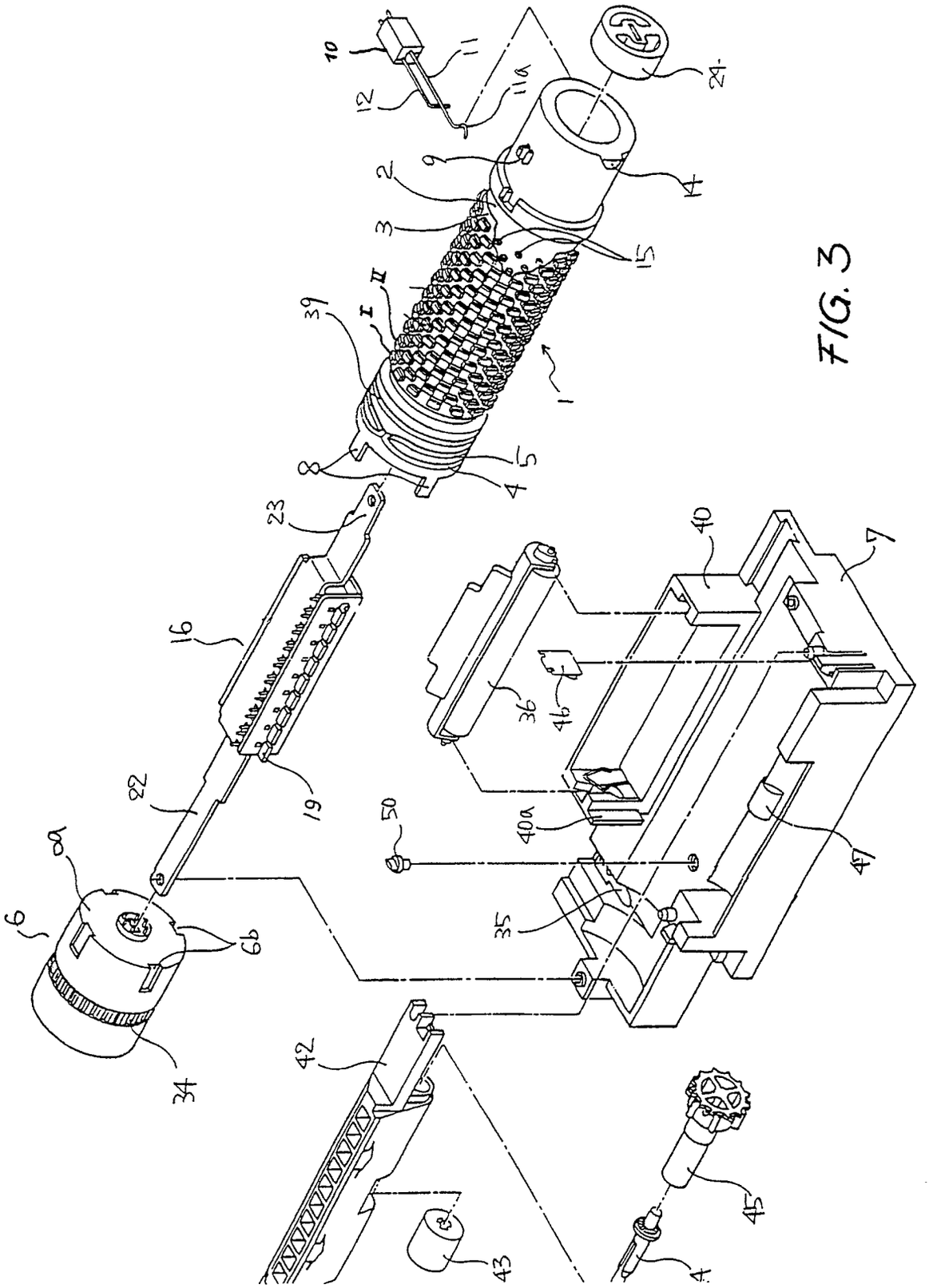
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FIG. 3

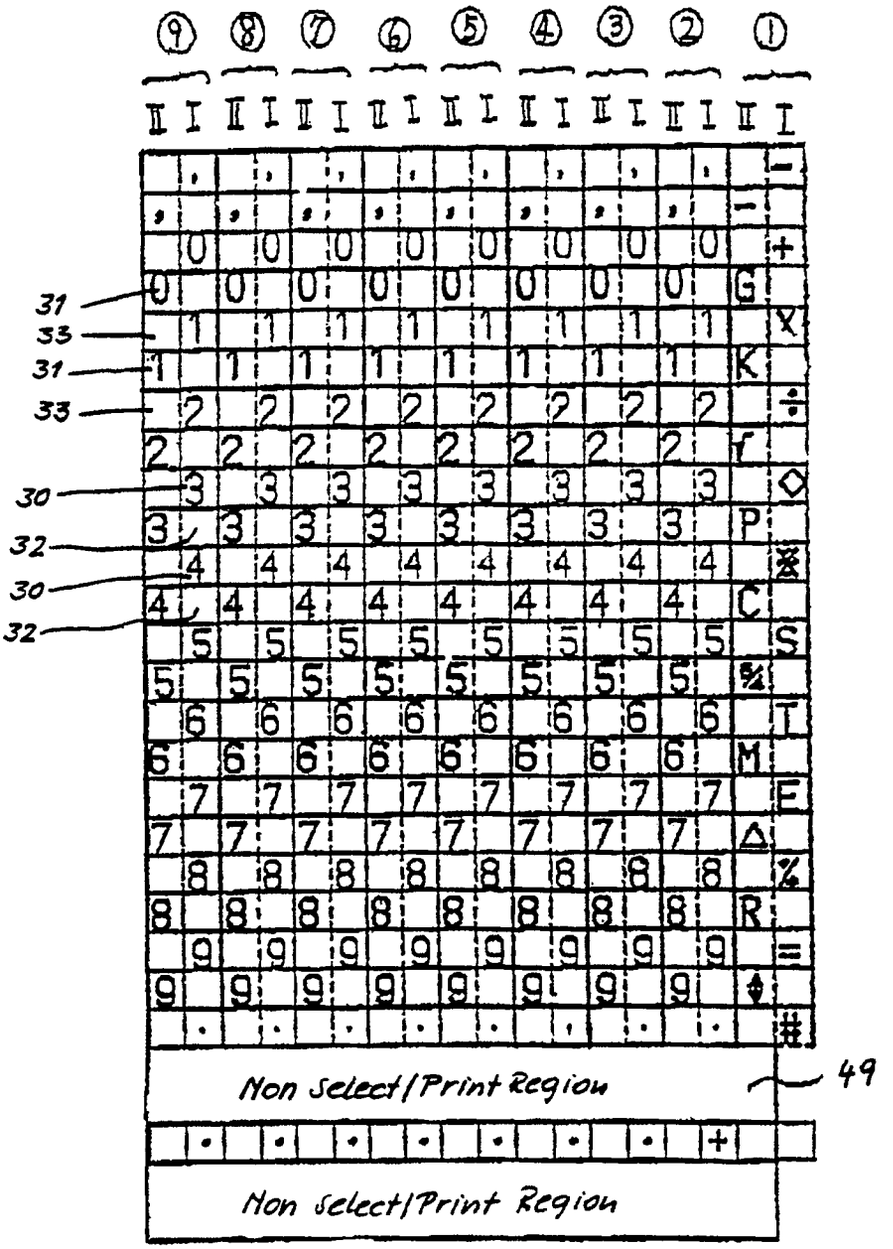
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FIG. 4

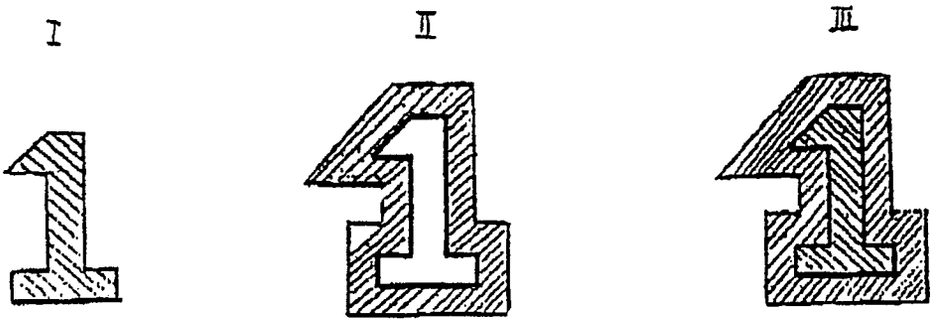



FIG. 5

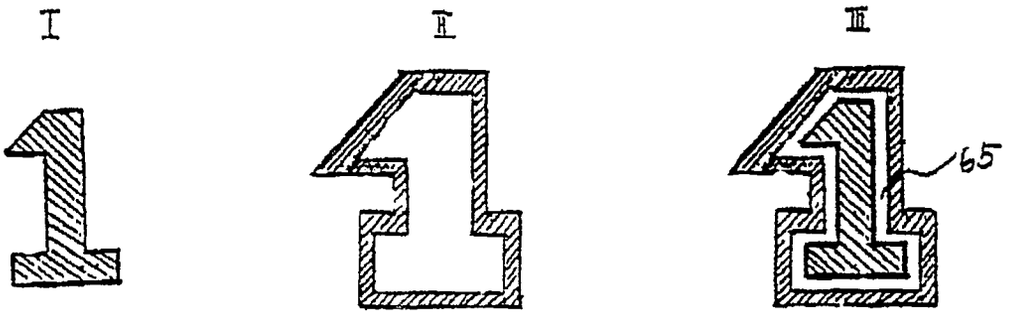



FIG. 11

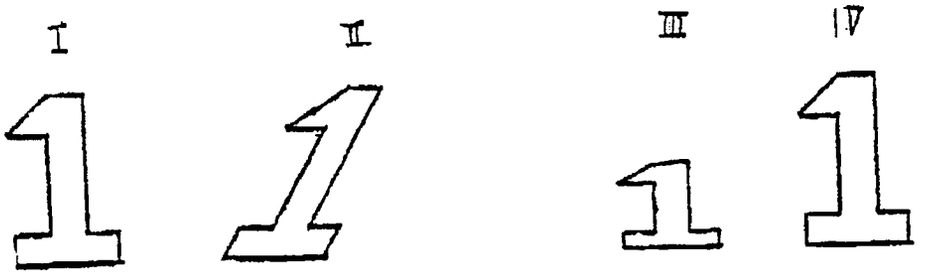



FIG. 12

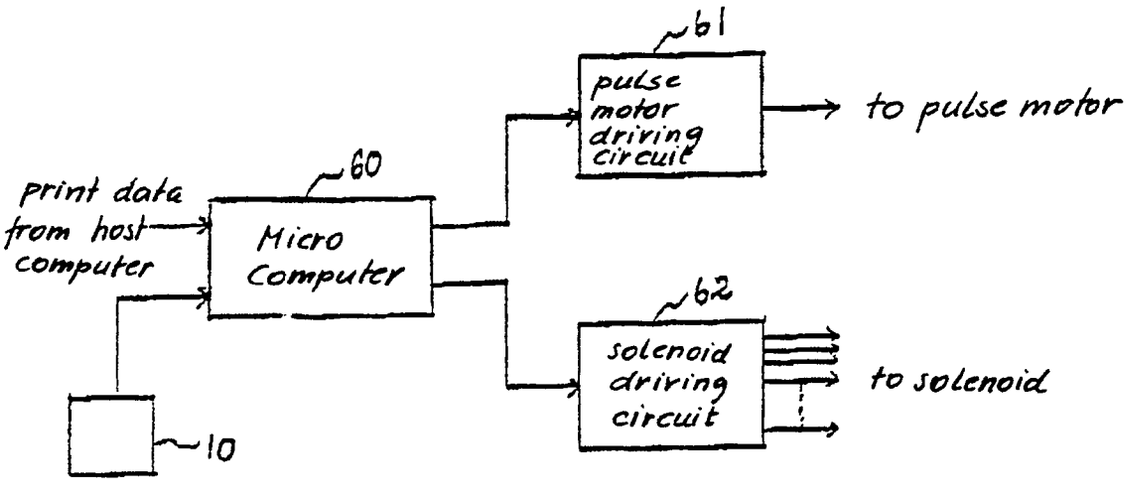

61
pulse motor driving circuit
to pulse motor
print data from host computer
60
Micro Computer
62
solenoid driving circuit
to solenoid
10

FIG. 6

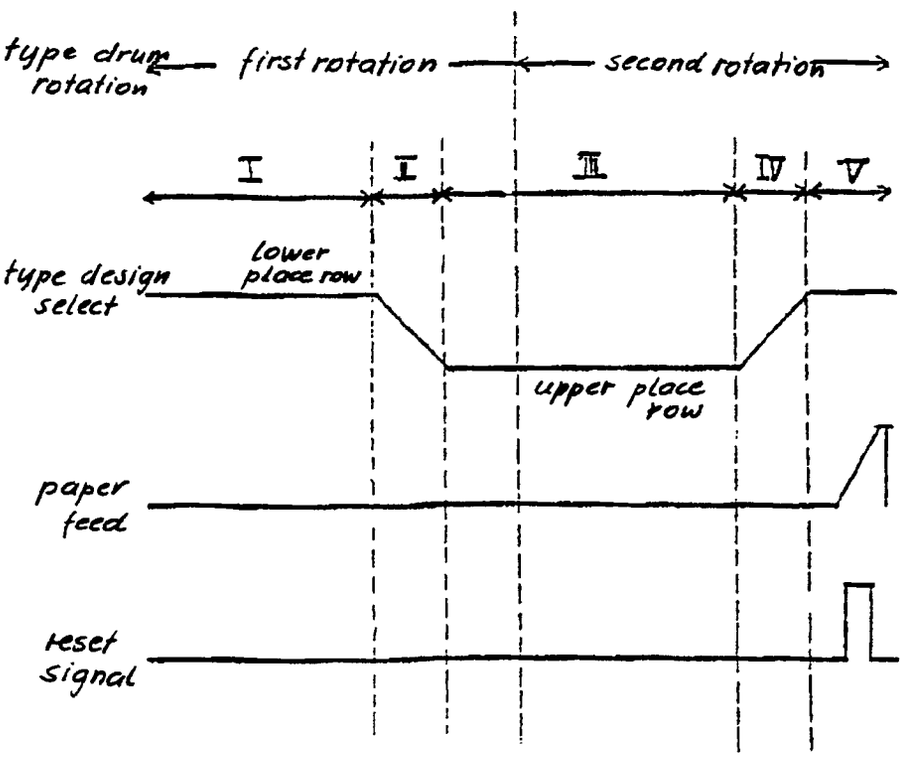

type drum rotation
first rotation
second rotation
I
II
III
IV
V
type design select
lower place row
upper place row
paper feed
reset signal

FIG. 7

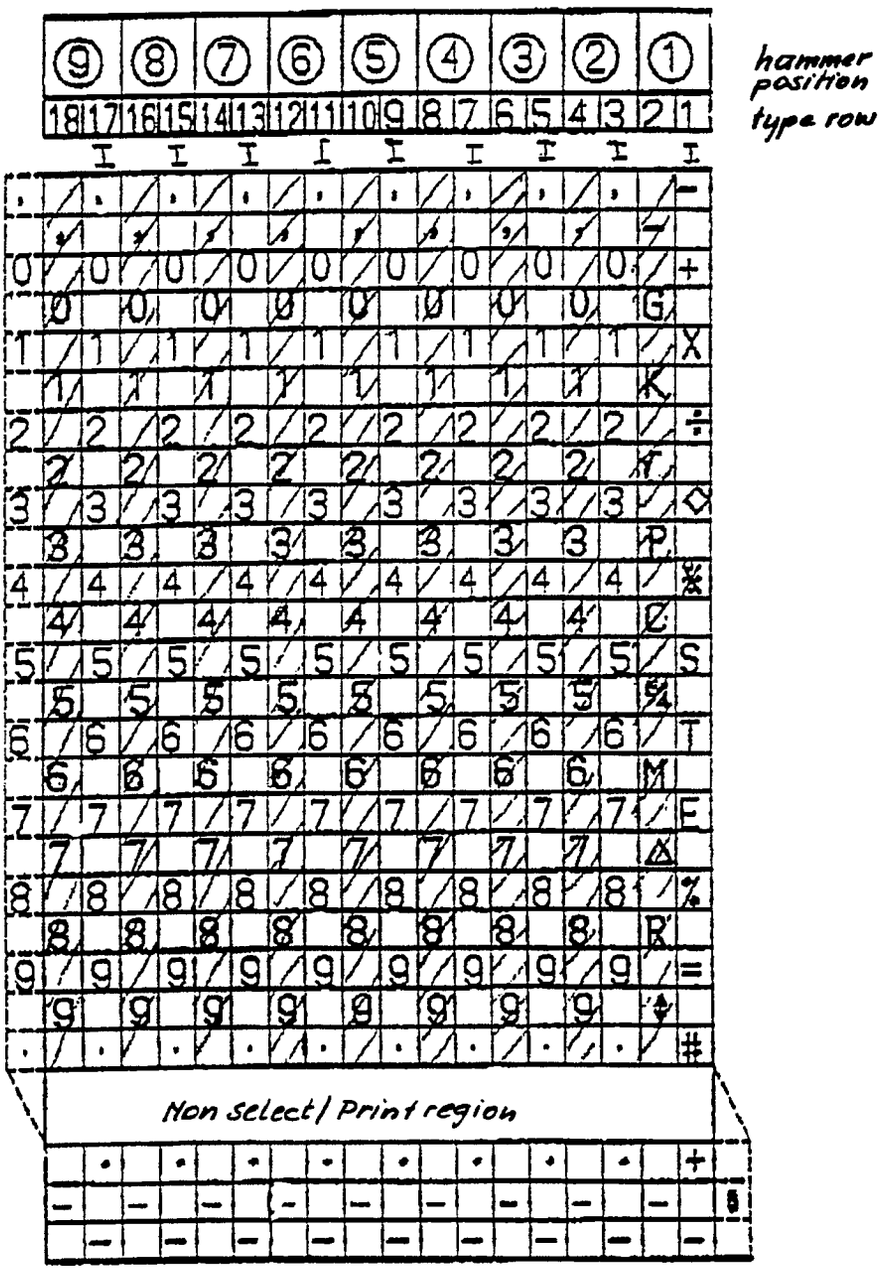



FIG. 8

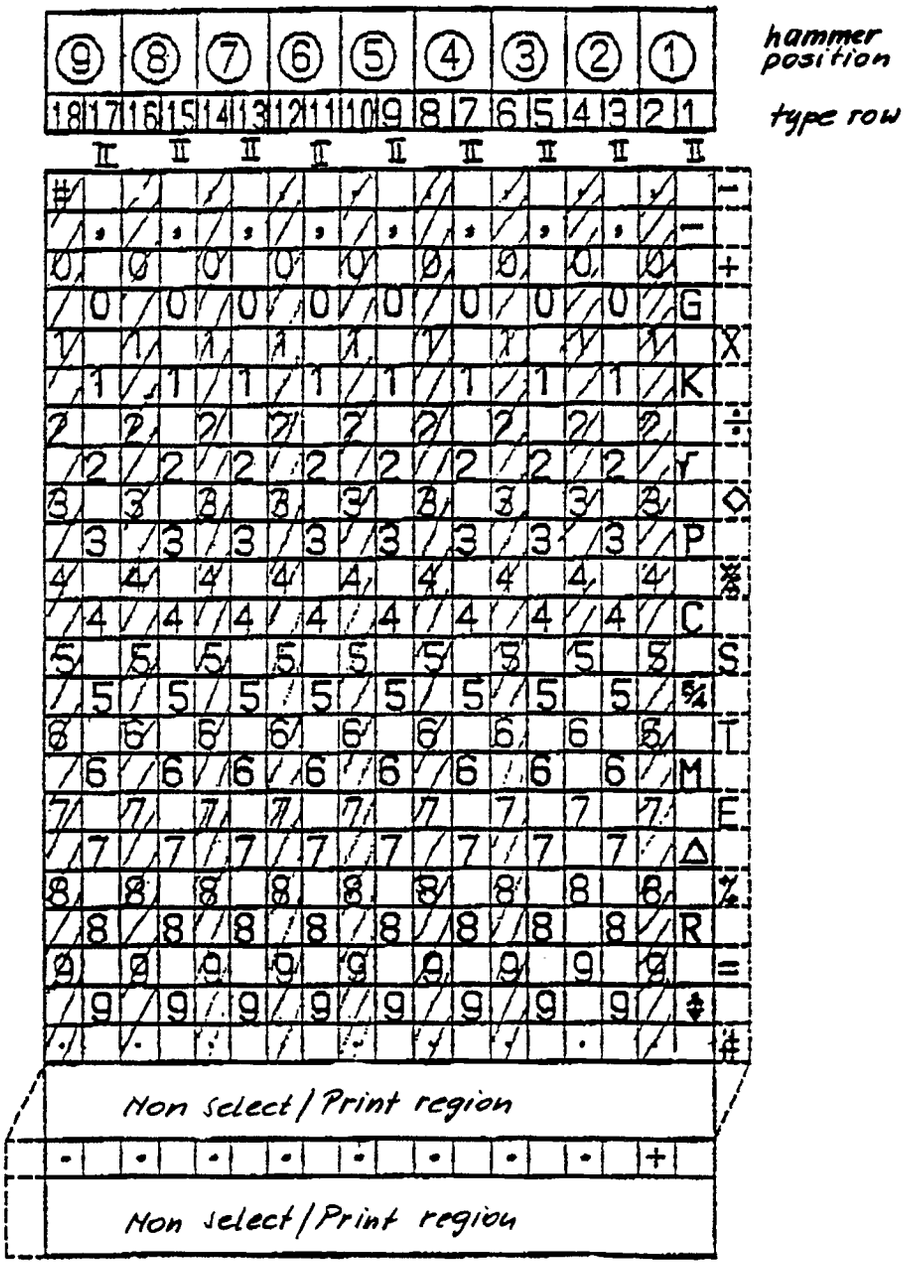
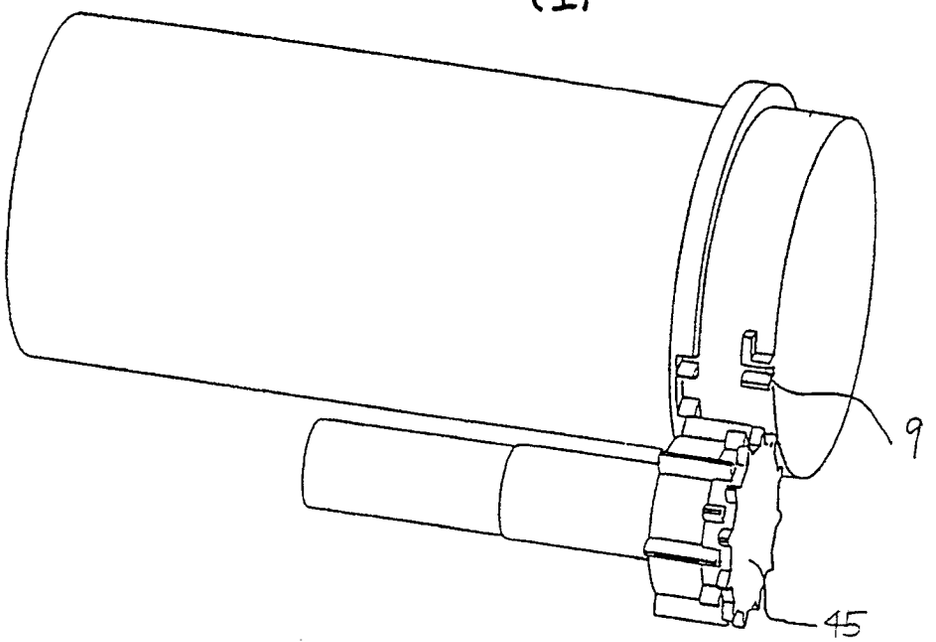

hammer position
type row
Non select / Print region
Non select / Print region

FIG. 9

(I)




(II)

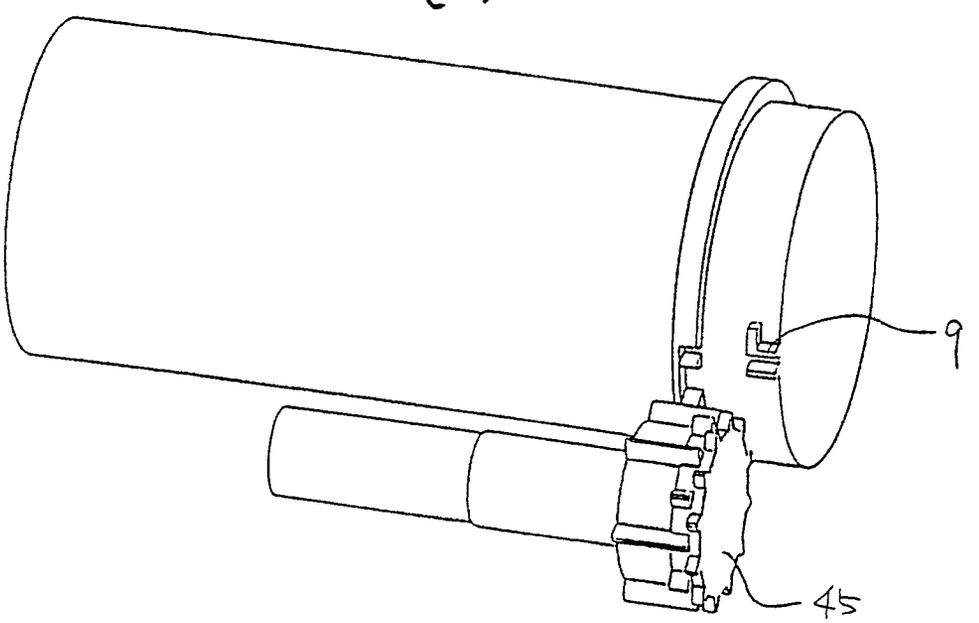



FIG. 10

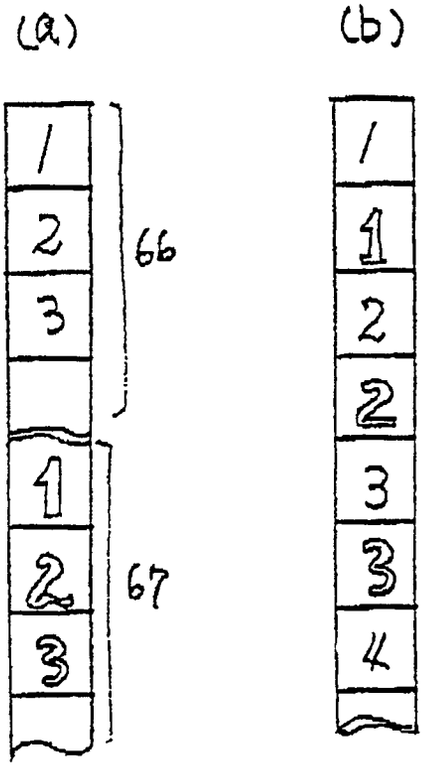



FIG. 13

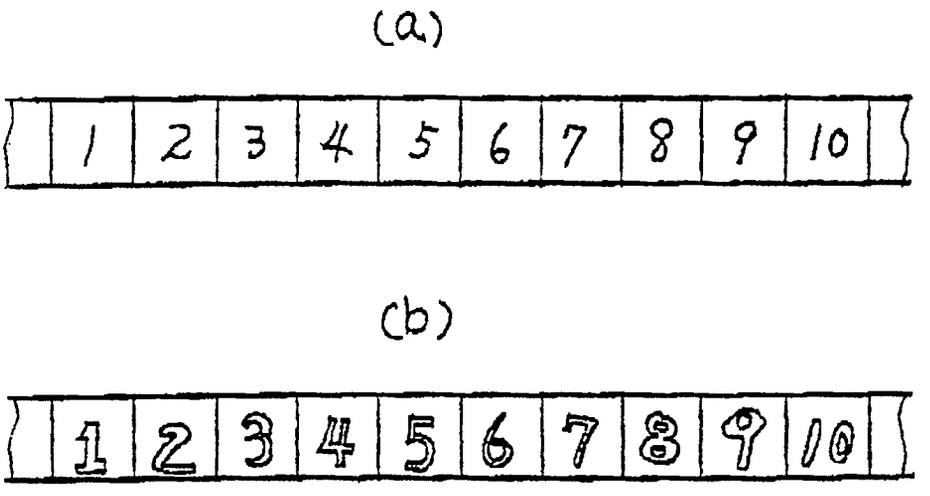



FIG. 17

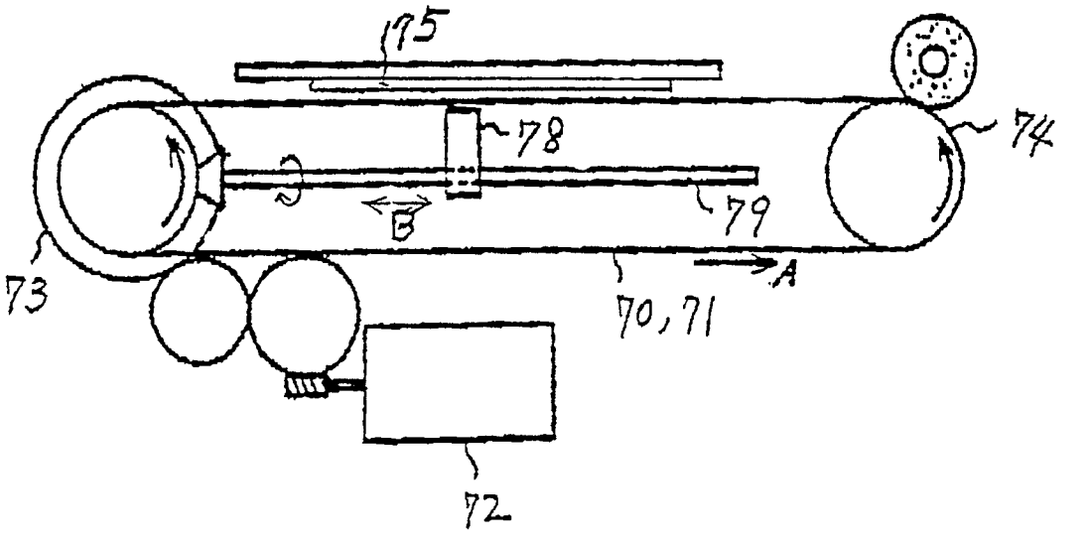



FIG. 14

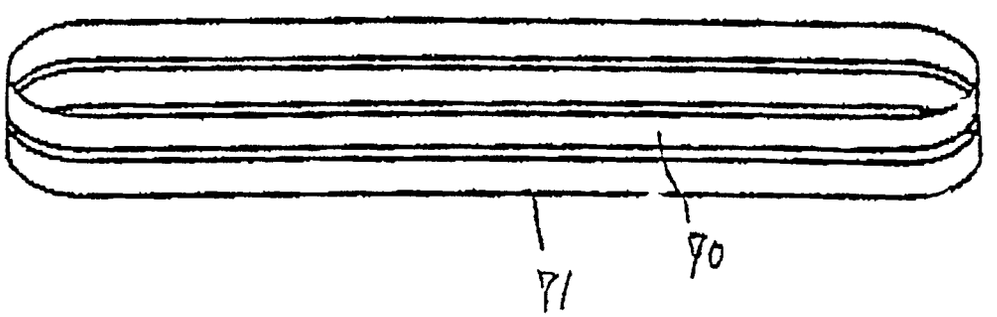



FIG. 15

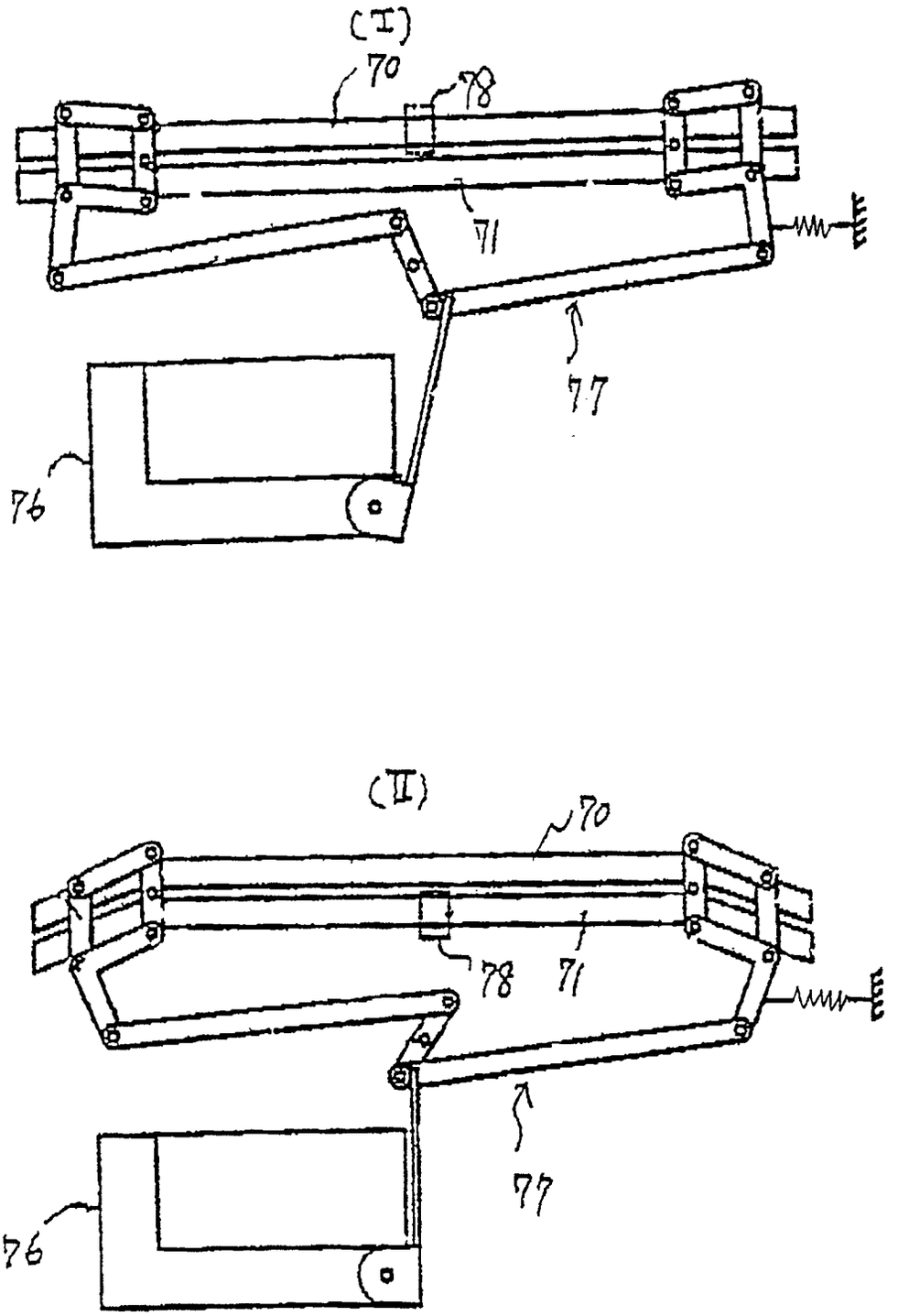



FIG. 16

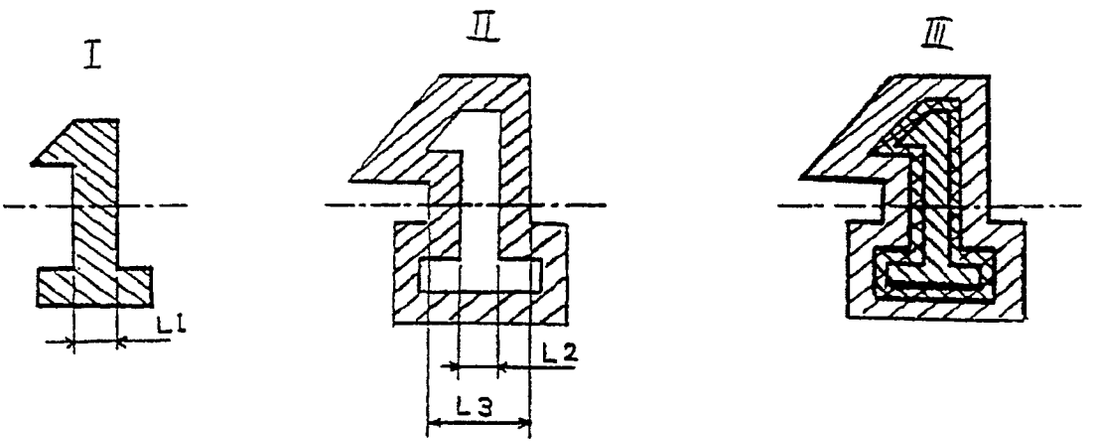



FIG. 18

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number

EP 91 10 2119

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---|---|---|---|
| A | US-A-4 723 855 (H. MIKOSHIBA et al.)<br>* figure 3B * | 1,2 | B 41 J 1/20<br>B 41 J 1/34<br>B 41 J 2/50 |
| A | PATENT ABSTRACTS OF JAPAN vol. 4, no. 68 (M-12)(550), 21 May 1980;<br>& JP - A - 5532601 (FUJITSU K.K.) 07.03.1980 | 1,3 | B 41 J 3/54 |
| A | PATENT ABSTRACTS OF JAPAN vol. 11, no. 54 (M-563)(2501), 19 February 1987;<br>& JP - A - 61217271 (ALPS ELECTRIC CO.) 26.09.1986 | 1,3 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 41 J

The present search report has been drawn up for all claims

| Place of search | Date of completion of search | Examiner |
|---|---|---|
| Berlin | 17 April 91 | ZOPF K |

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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